Massively Threaded Visualization Algorithms for the **Next Generation of High Performance Computing**



Seconds

Threshold (No Point Merging)

Threshold (With Point Merging)

0.10



0.149

0.239

0.169

0.189

13.79s

8.375

14.33s

6.735

Objective

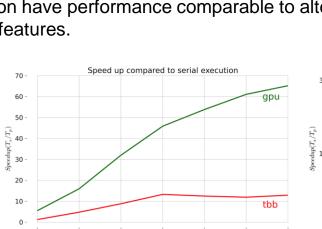
- Develop readiness for scientific data analysis and visualization at extreme scale.
 - Address challenges of emerging architectures.
- In addition to designing our own algorithms, build a toolkit that enables others to build algorithms.

Technology

- The Dax Toolkit: a visualization toolkit containing a framework that reduces the challenges of writing highly concurrent algorithms.
- Current investment is 3 year project.
- Supports simple porting across CPU and GPU architectures.
- Algorithms written at higher abstraction have performance comparable to alternates written by experts with APIs providing full access to parallel features.

Impact

- Dax applied to analysis of N-body cosmology simulation to identify void, pancake, filament, and clump features.
- Requires expensive operation of finding cells in irregular, self-intersecting mesh.
- Dax demonstrates finding cells while yielding speedups of up to 22 × with multiple cores and 65 × using a GPU.



Xeon E5-2670 PISTON-TBB-32

Xeon X5570

Fermi M2050

Xeon E5-2670

Xeon X5570

Dax-TBB-32

Dax-TBB-16

Dax-CUDA

VTK-Serial

Dax-Serial Dax-TBB-32

VTK-Serial

Dax-Serial

Dax-TBB-16

PISTON-TBB-16

PISTON-CUDA

